

REMARKS

Claim 7 stands rejected under 35 U.S.C. 102(b) as being anticipated by Johnson (U.S. 5,654,566). Applicants respectfully traverse this rejection because the cited reference does not disclose (or suggest) a magnetic sensor having a nonmagnetic layer made of semiconductor material that itself causes a current to flow from one of the ferromagnetic bodies to the other, as in claim 7 of the present invention, as amended.

According to the present invention, and specifically claim 7, a magnetic sensor using a spin-filtered sensing current allows the current to flow through the semiconductor layer when the magnetization in the free layer (which is provided at an end of a semiconductor layer) is parallel to the spin direction of the electrons and the spin-filtered sensing current. On the other hand, when the free layer magnetization is in an opposite direction, the spin-filtered sensing current does not flow through the semiconductor layer. The sensor according to this configuration is significantly different than the sensor taught by Johnson.

The magnetic sensor disclosed by Johnson (Figs. 4, 6B) requires the presence of a gate electrode on the semiconductor layer that constitutes the nonmagnetic layer. Johnson further requires that the ferroelectric bodies 110, 116 are formed on respective source and drain diffusion regions that are formed in the semiconductor layer with a conductivity type opposite to the of the semiconductor layer itself. According to this configuration, conduction between the ferroelectric bodies 110, 116 cannot occur even when

the magnetization directions are parallel in these bodies unless a gate voltage is first applied to the gate electrode on the semiconductor layer, and a conductive channel is induced between the respective diffusion regions. Although a current does flow through the semiconductor layer in such an instance, this current flow is not caused by the semiconductor material of the layer, but instead only by the application of a gate voltage to the gate electrode. Accordingly, Johnson's disclosure cannot read upon the present invention.

As noted above, claim 7 of the present invention has been amended to more clearly recite that it is the semiconductor material that constitutes the nonmagnetic layer that itself causes a current to flow from one of the ferromagnetic bodies to the other. As also described above, Johnson's configuration cannot read upon this specific feature of the present invention, because the material of Johnson's semiconductor layer cannot by itself cause a current to flow from one body to the other. Johnson can only cause such a current flow with the application of a gate voltage. Accordingly, for at least these reasons, the Section 102 rejection of claim 7 based on Johnson is respectfully traversed.

Claims 8 and 9 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Johnson. Applicants respectfully traverse this rejection for at least the reasons discussed above in traversing the rejection of independent claim 7 based on the same Johnson reference. Claims 8 and 9 both depend from independent claim 7, and therefore include all of the features of the base claim, plus additional features.

Applicants further traverse the rejection because the present invention would not be obvious over the Johnson reference, as asserted by the Examiner. As described above, Johnson's sensor requires the use of a gate electrode, and also the presence of source and drain regions on opposite sides of the sensor. Such a device is significantly more complex (and therefore more expensive) than the much simpler device shown in Fig. 7 of the present invention. Johnson does not teach or suggest that such an advantageous configuration can be realized, and therefore even a *prima facie* case of obviousness would be sufficiently rebutted based on these advantages alone. Accordingly, the outstanding Section 103 rejection of claims 8 and 9 based on Johnson is further traversed.

For all of the foregoing reasons, Applicants submit that this Application, including claims 7-9, is in condition for allowance, which is respectfully requested. The Examiner is invited to contact the undersigned attorney if an interview would expedite prosecution.

Respectfully submitted,

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